

## เอกสารสอบเทียบเครื่องมือที่ใช้ในการวิเคราะห์

เอกสารสอบเทียบเครื่องมือ ตรวจวัดคุณภาพอากาศ  
ในบรรยากาศ และ คุณภาพ เสียง

รายการเครื่องมือที่ใช้ในการตรวจวัด/วิเคราะห์

No	Model	Serial Number	Part	Remark
1	TE-5170 (TSP)	2726	1	TSP/บ้านคลองบางพลี (A1)
2	TE-5170 (TSP)	2730	2	TSP/วัดบ้านพาสน์ (A2)
3	APNA-370	PIEJ99E5	3	NO <sub>2</sub> /บ้านคลองบางพลี (A1)
4	APNA-370	W2VNUX08	4	NO <sub>2</sub> /วัดบ้านพาสน์ (A2)
5	APSA-370	YDL839W0	5	SO <sub>2</sub> /บ้านคลองบางพลี (A1)
6	APSA-370	8R18JB8F	6	SO <sub>2</sub> /วัดบ้านพาสน์ (A2)
7	Test WS/WD Report	2302DR0081	7	WindSpeed/บ้านคลองบางพลี (A1)
8	Test WS/WD Report	2302DR0083	8	WindSpeed/วัดบ้านพาสน์ (A2)
9	แบบบันทึกการสอบเทียบเครื่อง Sound Level Meter	00396923	9	Noise/บ้านคลองบางพลี (N1)
10	แบบบันทึกการสอบเทียบเครื่อง Sound Level Meter	00396801	10	Noise/วัดบ้านพาสน์ (N2)

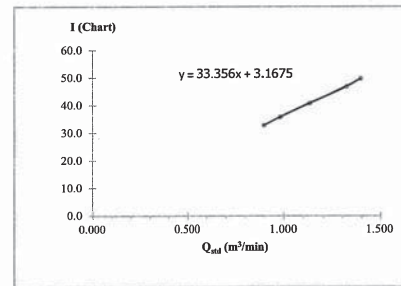


บริษัท ศูนย์วิเคราะห์น้ำ จำกัด  
WATER ANALYSIS CENTER COMPANY LIMITED  
1/94 หมู่ 5 ต.สามหมื่น อ.อุทัย จ.พระนครศรีอยุธยา 13210  
1/94 Moo 5, T.Kanham, A.U-Thai, Ayutthaya 13210, Thailand  
Tel: 0-35226-383, 0-35800-593 Fax: 0-35800-594

High Volume Air Sampler Calibration Worksheet

Project Site : นิคมอุตสาหกรรมบ้านหว้า (โศภค) Page 1 of 1  
Location : บ้านคลองบางพลี  
Date of measurement : 13/11/2024  
Worksheet No. : C-131124-WWL0097 Calibration Orifice : WWL0103  
High Volume ID : WWL0097 Calibrator ID : TE-5028A  
High Volume Model : TE-5170 (TSP) Calibrator S/N : 3271  
High Volume S/N : 2726 Calibrate Date : 27/03/2024  
Ambient Condition : 26 Quality Standard Slope : 1.59186  
Temperature (°C) : 756 Quality Standard Intercept : -0.01922  
Barometric Pressure (mmHg) :

Test No.	delta H <sub>2</sub> O (inch)	Q <sub>ad</sub> (m <sup>3</sup> /min)	I (Chart)	IC (Corrected)	Linear Regression
1	4.90	1.397	50.0	49.80	Slope : 33.22 Intercept : 3.155 Correlation Coefficient : 0.9995
2	4.40	1.324	47.0	46.81	
3	3.20	1.131	41.0	40.83	
4	2.40	0.981	36.0	35.85	
5	2.00	0.897	33.0	32.87	



Calibrated by : Mr. JITTAWEE WONGMAKHEB

Approved by : Mr. RUNGSASIKORN KOSUM

FOLAB 5.5-1/25

แก้ไขครั้งที่: 1 วันที่บังคับใช้: 1 ต.ค. 2560 หน้า: 1 ของ 1

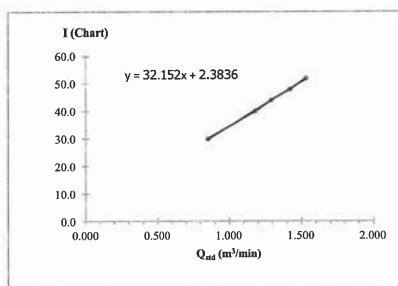


บริษัท ศูนย์วิเคราะห์น้ำ จำกัด  
WATER ANALYSIS CENTER COMPANY LIMITED  
1/94 หมู่ 5 ต.สามหมื่น อ.อุทัย จ.พระนครศรีอยุธยา 13210  
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Tel: 0-35226-383, 0-35800-593 Fax: 0-35800-594

High Volume Air Sampler Calibration Worksheet

Project Site : นิคมอุตสาหกรรมบ้านหว้า (โศภค) Page 1 of 1  
Location : วัดบ้านพาสน์  
Date of measurement : 13/11/2024  
Worksheet No. : C-131124-WWL0096 Calibration Orifice : WWL0103  
High Volume ID : WWL0096 Calibrator ID : TE-5028A  
High Volume Model : TE-5170 (TSP) Calibrator S/N : 3271  
High Volume S/N : 2730 Calibrate Date : 27/03/2024  
Ambient Condition : 26 Quality Standard Slope : 1.59186  
Temperature (°C) : 756 Quality Standard Intercept : -0.01922  
Barometric Pressure (mmHg) :

Test No.	delta H <sub>2</sub> O (inch)	Q <sub>ad</sub> (m <sup>3</sup> /min)	I (Chart)	IC (Corrected)	Linear Regression
1	5.90	1.532	52.0	51.79	Slope : 32.02 Intercept : 2.374 Correlation Coefficient : 0.9993
2	5.10	1.425	48.0	47.81	
3	4.20	1.294	44.0	43.82	
4	3.50	1.183	40.0	39.84	
5	1.80	0.851	30.0	29.88	



Calibrated by : Mr. JITTAWEE WONGMAKHEB

Approved by : Mr. RUNGSASIKORN KOSUM

FOLAB 5.5-1/25

แก้ไขครั้งที่: 1 วันที่บังคับใช้: 1 ต.ค. 2560 หน้า: 1 ของ 1

ภาคผนวก ข - □

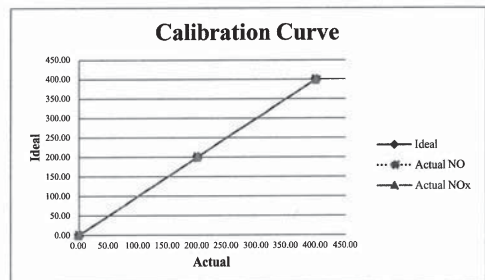


บริษัท ศูนย์วิเคราะห์น้ำ จำกัด  
WATER ANALYSIS CENTER COMPANY LIMITED  
1/94 หมู่ 5 ต.สามหมื่น อ.อุทัย จ.พระนครศรีอยุธยา 13210  
1/94 Moo 5, T.Kanham, A.U-Thai, Ayutthaya 13210, Thailand  
Tel: 0-35226-383, 0-35800-593 Fax: 0-35800-594

Nitrogen Dioxide Analyzer Calibration Worksheet

Project Site : นิคมอุตสาหกรรมบ้านหว้า (โศภค)  
Location : บ้านคลองบางพลี  
Date of measurement : 13 November 2024  
Worksheet No. : C-131124-WWL 0114  
Ambient NO<sub>x</sub> Analyzer ID : WWL 0114  
Manufacturer : HORIBA  
Ambient NO<sub>x</sub> Analyzer Model : APNA-370  
Ambient NO<sub>x</sub> Analyzer S/N : PIEJ99E5  
Multi Gas Calibrator : WWL0124  
Calibrator ID : Series 6100  
Calibrator Model : S/N 7462  
Calibrator S/N : 08 March 2024  
Calibrate Date : 50.90  
Cylinder Std. Gas : Std. Gas Concentration (PPM)  
Cylinder Pressure (psi) : 2000  
Certified Date : 07 December 2021  
Expired Date : 07 December 2025  
Serial No. : CC241587

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NO <sub>x</sub>	Error NO <sub>x</sub>	%Error NO <sub>x</sub>
ZERO	0.00	0.10	0.10	-	0.10	0.10	-
SPAN 200 ppb	200.00	200.10	0.10	0.05	200.10	0.10	0.05
SPAN 400 ppb	400.00	400.20	0.20	0.05	400.10	0.10	0.03
AVERAGE (%)				0.05	0.04		



Calibrated by : Miss SUTHIDA SINGHAPHEN  
Chemist

Approved by : Mr. RUNGSASIKORN KOSUM  
Technical Management

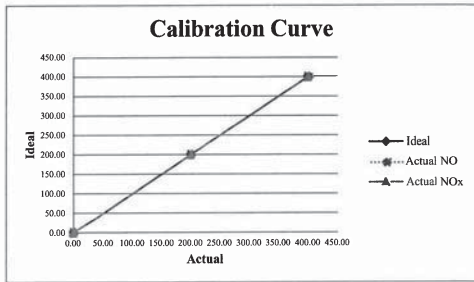


### Nitrogen Dioxide Analyzer Calibration Worksheet

Project Site : นิคมอุตสาหกรรมบ้านหว้า (ไฮเทค)  
Location : วัดบ้านพาสณ์  
Date of measurement : 13 November 2024  
Worksheet No. : C-0131124-WWL 0118  
Ambient NOx Analyzer ID : WWL 0118  
Manufacturer : HORIBA  
Ambient NOx Analyzer Model : APNA-370  
Ambient NOx Analyzer S/N : W2VNUX08

Multi Gas Calibrator  
Calibrator ID : WWL0124  
Calibrator Model : Series 6100  
Calibrator S/N : S/N 7462  
Calibrate Date : 08 March 2024  
Cylinder Std. Gas  
Std. Gas Concentration (PPM) : 50.90  
Cylinder Pressure (psi) : 2000  
Certified Date : 07 December 2021  
Expired Date : 07 December 2025  
Serial No. : CC241587

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NO <sub>x</sub>	Error NO <sub>x</sub>	%Error NO <sub>x</sub>
ZERO	0.00	0.10	0.10	-	0.10	0.10	-
SPAN 200 ppb	200.00	200.10	0.10	0.05	200.10	0.10	0.05
SPAN 400 ppb	400.00	400.10	0.10	0.03	400.20	0.20	0.05
AVERAGE (%)				0.04			0.05



Calibrated by :   
(Miss SUTHIDA SINGHAPHEN)  
Chemist

Approved by :   
(Mr. RUNGSASIKORN KOSUM)  
Technical Management

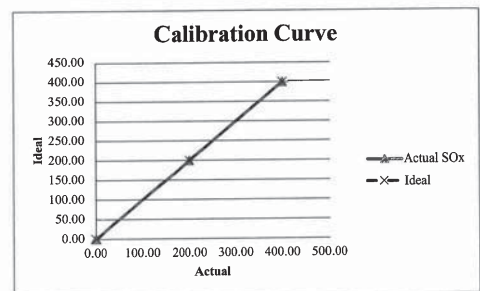


### Sulfur Dioxide Analyzer Calibration Worksheet

Project Site : นิคมอุตสาหกรรมบ้านหว้า (ไฮเทค)  
Location : บ้านคลองบางพรหม  
Date of measurement : 13 November 2024  
Worksheet No. : C-131124WWL 0109  
Ambient SO<sub>x</sub> Analyzer ID : WWL 0109  
Manufacturer : HORIBA  
Ambient SO<sub>x</sub> Analyzer Model : APSA-370  
Ambient SO<sub>x</sub> Analyzer S/N : YDL839W0

Multi Gas Calibrator  
Calibrator ID : WWL0124  
Calibrator Model : Series 6100  
Calibrator S/N : S/N 7462  
Calibrate Date : 08 March 2024  
Cylinder Std. Gas  
Std. Gas Concentration (PPM) : 50.90  
Cylinder Pressure (psi) : 2000  
Certified Date : 07 December 2021  
Expired Date : 07 December 2025  
Serial No. : CC241587

Point	CALIBRATION RESULTS			
	Ideal	Actual SO <sub>x</sub>	Error Sox	%Error Sox
ZERO	0.00	0.10	0.10	-
SPAN 200 ppb	200.00	200.10	0.10	0.05
SPAN 400 ppb	400.00	400.10	0.10	0.03
AVERAGE (%)				0.04



Calibrated by :   
(Miss SUTHIDA SINGHAPHEN)  
Chemist

Approved by :   
(Mr. RUNGSASIKORN KOSUM)  
Technical Management

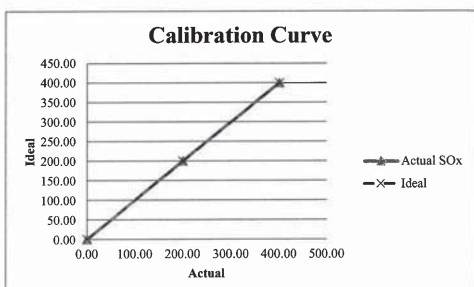


### Sulfur Dioxide Analyzer Calibration Worksheet

Project Site : นิคมอุตสาหกรรมบ้านหว้า (ไฮเทค)  
Location : วัดบ้านพาสณ์  
Date of measurement : 13 November 2024  
Worksheet No. : C-131124WWL 0112  
Ambient SO<sub>x</sub> Analyzer ID : WWL 0112  
Manufacturer : HORIBA  
Ambient SO<sub>x</sub> Analyzer Model : APSA-370  
Ambient SO<sub>x</sub> Analyzer S/N : 8R18JBBF

Multi Gas Calibrator  
Calibrator ID : WWL0124  
Calibrator Model : Series 6100  
Calibrator S/N : S/N 7462  
Calibrate Date : 08 March 2024  
Cylinder Std. Gas  
Std. Gas Concentration (PPM) : 50.90  
Cylinder Pressure (psi) : 2000  
Certified Date : 07 December 2021  
Expired Date : 07 December 2025  
Serial No. : CC241587

Point	CALIBRATION RESULTS			
	Ideal	Actual SO <sub>x</sub>	Error Sox	%Error Sox
ZERO	0.00	0.10	0.10	-
SPAN 200 ppb	200.00	200.20	0.20	0.10
SPAN 400 ppb	400.00	400.10	0.10	0.03
AVERAGE (%)				0.06



Calibrated by :   
(Miss SUTHIDA SINGHAPHEN)  
Chemist

Approved by :   
(Mr. RUNGSASIKORN KOSUM)  
Technical Management



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## Certificate of Calibration

### WL-21 Wireless Anemometer

Scarlet Tech Ltd. hereby certifies that the WL-21 wireless anemometer listed below was thoroughly calibrated, tested and inspected following the standard calibration procedure (st-wl-21) and is within manufacturer's specification at the time when the calibration is done

Client: Envir Service Co., Ltd.  
Serial: 2302DR0081  
Calibration Date: 2024/3/29  
Calibration Expiry Date: 2025/3/28

#### The Result of Calibration

Measured Value (m/s)		Actual Value (m/s)		Velocity Deviation	Tolerance	Result
1.0	1.0	1.0	0.0	0.9-1.1	Pass	
1.9	1.9	1.9	0.0	1.8-2.2	Pass	
4.9	5.0	5.0	0.1	4.7-5.3	Pass	
7.0	7.1	7.1	0.1	6.0-8.0	Pass	
10.0	10.0	10.0	0.0	9.5-10.5	Pass	
19.6	19.9	19.9	0.3	19.0-21.0	Pass	
Measured Value (m/s)		Actual Value (m/s)		Wind Direction Deviation	Tolerance	Result
48°	47°	47°	1	42-48	Pass	
135°	135°	135°	0	132-138	Pass	
226°	226°	226°	0	222-228	Pass	
316°	316°	316°	0	312-318	Pass	
359°	0°	0°	1	357-3	Pass	
Inspection Room Temp		Actual Value	Deviation	Tolerance	Result	
22.2°C		22.5	0.3	21.5-23.5	Pass	
Atmospheric Pressure Inspection		Actual Value	Deviation	Tolerance	Result	
1007		1004	3	1001-1019	Pass	

Environment Conditions:  
Air temperature: 22 °C  
Relative humidity: 55 %  
Static pressure: 102.2 kPa

Performed by :   
Certified by Head of Engineering Department

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4F-3, No. 347, 2nd Sec, Heping E. Rd., Daan Dist. Taipei City 106, Taiwan





# Certificate of Calibration

## WL-21 Wireless Anemometer

Scarlet Tech Ltd. hereby certifies that the WL-21 wireless anemometer listed below was thoroughly calibrated, test and inspected following the standard calibration procedure (st-wl-21) and is within manufacture's specification at the time when the calibration is done

Client: Envir Service Co. Ltd.  
Serial: Z3020R0083  
Calibration Date: 2024/3/29  
Calibration Expiry Date: 2025/3/28

### The Result of Calibration

Measured Value (m/s)		Actual Value (m/s)		Deviation	Tolerance	Result
1.0	1.1	0.1	0.9-1.1	Pass		
1.9	2.0	0.1	1.8-2.2	Pass		
4.9	5.0	0.1	4.7-5.3	Pass		
7.0	7.1	0.1	6.8-8.0	Pass		
10.0	10.0	0.0	9.5-10.5	Pass		
19.6	20.0	0.4	19.2-21.0	Pass		

Measured Value (m/s)		Actual Value (m/s)		Deviation	Tolerance	Result
48°	49°	1°	42-48	Pass		
135°	135°	0	132-138	Pass		
226°	226°	0	222-228	Pass		
316°	315°	1°	312-318	Pass		
359°	0°	1°	357-3	Pass		

Inspection Room Temp	Actual Value	Deviation	Tolerance	Result
22.2°C	22.5	0.3	21.5-23.5	Pass

Atmospheric Pressure Inspection	Actual Value	Deviation	Tolerance	Result
1007	1005	2	1001-1019	Pass

#### Environment Conditions:

Air temperature: 22 °C  
Relative humidity: 55 %  
Static pressure: 102.2 kPa

Performed by:

Certified by Head of Engineering Department



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FO.LAB 6.4-1 /28

แก้ไขครั้งที่ : 0

วันที่บังคับใช้ : 1 ม.ค. 2562

หน้า : 1 ของ 1

### แบบบันทึกการทวนสอบเครื่อง Sound Level Meter

เครื่อง CA111 Sound Calibrator S/N 520272	รหัสเครื่องมือ SR004	เกณฑ์การยอมรับ 93.77 ± 0.3, 113.88 ± 0.3
วันที่สอบเทียบ 09/05/67	วันที่สอบเทียบครั้งต่อไป 08/05/68	
เครื่อง Digital Thermohygro Meter S/N 105091609	รหัสเครื่องมือ WWL 0055	
วันที่สอบเทียบ 29/11/66	วันที่สอบเทียบครั้งต่อไป 28/11/67	
เครื่อง Sound Level Meter S/N 00396923	รหัสเครื่องมือ WWL 0161	
วันที่สอบเทียบ 31/05/66	วันที่สอบเทียบครั้งต่อไป 30/05/68	

#### การทวนสอบก่อนออกหน้างาน

อุณหภูมิ (°C) 25	เกณฑ์การยอมรับ 23.0±3.0
ความชื้นสัมพัทธ์ (%) 58	เกณฑ์การยอมรับ 50.0±15.0
วันที่ทวนสอบ 18/11/67	

#### การทวนสอบหลังจากออกหน้างาน

อุณหภูมิ (°C) 25	เกณฑ์การยอมรับ 23.0±3.0
ความชื้นสัมพัทธ์ (%) 58	เกณฑ์การยอมรับ 50.0±15.0
วันที่ทวนสอบ 22/11/67	

Item	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 94.0dB)	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 114.0dB)	Item	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 94.0dB)	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 114.0dB)
1	93.8	113.9	1	93.8	113.9
2	93.8	113.9	2	93.8	113.9
3	93.8	113.9	3	93.8	113.9
4	93.8	113.9	4	93.8	113.9
5	93.8	113.9	5	93.8	113.9
6	93.8	113.9	6	93.8	113.9
7	93.8	113.9	7	93.8	113.9
8	93.8	113.9	8	93.8	113.9
9	93.8	113.9	9	93.8	113.9
10	93.8	113.9	10	93.8	113.9
X	93.80	113.90	X	93.80	113.90
SD	0.00	0.00	SD	0.00	0.00
%RSD (≤ 10)	0.00	0.00	%RSD (≤ 10)	0.00	0.00
ผลการ ทวนสอบ	ผ่าน	ผ่าน	ผลการ ทวนสอบ	ผ่าน	ผ่าน

ผู้บันทึก

ผู้ตรวจสอบ

ผู้บันทึก

ผู้ตรวจสอบ



FO.LAB 6.4-1 /28

แก้ไขครั้งที่ : 0

วันที่บังคับใช้ : 1 ม.ค. 2562

หน้า : 1 ของ 1

### แบบบันทึกการทวนสอบเครื่อง Sound Level Meter

เครื่อง CA111 Sound Calibrator S/N 520272	รหัสเครื่องมือ SR004	เกณฑ์การยอมรับ 93.77 ± 0.3, 113.88 ± 0.3
วันที่สอบเทียบ 09/05/67	วันที่สอบเทียบครั้งต่อไป 08/05/68	
เครื่อง Digital Thermohygro Meter S/N 105091609	รหัสเครื่องมือ WWL 0055	
วันที่สอบเทียบ 29/11/66	วันที่สอบเทียบครั้งต่อไป 28/11/67	
เครื่อง Sound Level Meter S/N 00396801	รหัสเครื่องมือ WWL 0159	
วันที่สอบเทียบ 12/02/67	วันที่สอบเทียบครั้งต่อไป 11/02/69	

#### การทวนสอบก่อนออกหน้างาน

อุณหภูมิ (°C) 25	เกณฑ์การยอมรับ 23.0±3.0
ความชื้นสัมพัทธ์ (%) 58	เกณฑ์การยอมรับ 50.0±15.0
วันที่ทวนสอบ 18/11/67	

#### การทวนสอบหลังจากออกหน้างาน

อุณหภูมิ (°C) 25	เกณฑ์การยอมรับ 23.0±3.0
ความชื้นสัมพัทธ์ (%) 58	เกณฑ์การยอมรับ 50.0±15.0
วันที่ทวนสอบ 22/11/67	

Item	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 94.0dB)	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 114.0dB)	Item	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 94.0dB)	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 114.0dB)
1	93.8	113.9	1	93.8	113.9
2	93.8	113.9	2	93.8	113.9
3	93.8	113.9	3	93.8	113.9
4	93.8	113.9	4	93.8	113.9
5	93.8	113.9	5	93.8	113.9
6	93.8	113.9	6	93.8	113.9
7	93.8	113.9	7	93.8	113.9
8	93.8	113.9	8	93.8	113.9
9	93.8	113.9	9	93.8	113.9
10	93.8	113.9	10	93.8	113.9
X	93.80	113.90	X	93.80	113.90
SD	0.00	0.00	SD	0.00	0.00
%RSD (≤ 10)	0.00	0.00	%RSD (≤ 10)	0.00	0.00
ผลการ ทวนสอบ	ผ่าน	ผ่าน	ผลการ ทวนสอบ	ผ่าน	ผ่าน

ผู้บันทึก

ผู้ตรวจสอบ

ผู้บันทึก

ผู้ตรวจสอบ

เอกสารสอบเทียบเครื่องมือตรวจวัดคุณภาพน้ำเสีย น้ำผิวดิน ดิน  
พื้นที่สีเขียว และ ตะกอนประปา



## CERTIFICATE OF CALIBRATION

Certificate No.: C0-1608001/24 Page 1 of total 4 pages

**Customer:** WATER ANALYSIS CENTER CO., LTD.  
1/94 Moo 5, T.Kanham,  
A.U-thai, Ayutthaya 13210

**Equipment:** pH Meter  
**Manufacturer:** METTLER TOLEDO **Model:** SevenCompact S220  
**Serial No.:** B327527211 **ID No.:** WWL 0068  
**Description:** Range : 0 - 14 pH, Resolution : 0.01 pH

**Environmental Conditions:** Ambient Temperature: (20 ± 2) °C  
Relative Humidity: (50 ± 10) %  
Atmospheric Pressure: -



**Calibration Location:** Jayhawks Laboratory (CL&GL)

**Received Date:** 16 August 2024

**Calibration Date:** 16 August 2024

**Date of Issue:** 19 August 2024

**Condition of Artifacts:** Used conditions but can be calibrated

Checked by:  Approved by:   
Act as Technical Manager Representative of Managing Director

( ) ( Krisyosol K. ) ( ) ( Sakda Y. )  
( ) ( Patiphan K. ) ( ) ( Onnapa P. )  
( ) ( Pongsak H. ) ( ) ( Nitiphong K. )  
( ) ( Kanung C. ) ( ) ( Nonthachai K. )  
( ) ( Pramong P. ) ( ) ( Noppol P. )

( Dr. Ekachai Puttitwong )

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FE-169

REV.02 02/24/21

Certificate No.: C0-1608001/24

Page 2 of total 4 pages

**Reference Method:**

- The calibration method used was CP-178 based on an in-house method.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

**Reference Standard:**

Type	pH Value	Lot No.	Due Date	Traceability
pH Standard Solution	4.01	150823	Feb. 9, 2025	NIMT
	7.01	180723	Jan. 12, 2025	
	10.01	160823	Jan. 16, 2025	

Type	Serial No.	Certificate No.	Due Date	Traceability
Documenting Process Calibrator	2630521	10-2312001/23	Dec. 24, 2024	THC
Digital Thermometer with Sensor	1709138 / 4605984-005	10-0806001/24	Jun. 7, 2025	

**Remark:** This certificate is traceable to the International System of Unit (SI Unit) through:

- NIMT, National Institute of Metrology (Thailand).
- THC, Thai Heart Calibration Co., Ltd.

**Measurement Results:**

1. Function Simulated pH Meter

Standard Applied ( mV )	Nominal Value ( pH )	UUC Reading		Uncertainty ( ± mV )
		pH	mV	
177.48	4.00	4.01	177.3	0.060
0.00	7.00	7.00	-0.1	0.060
-177.48	10.00	10.01	-177.4	0.060

UUC : Unit Under Calibration

Note : Adjust Curve to simulate pH (4,7,10)

Calibrated by: Athipat  
REV.02 02/24/21

FE-169

Certificate No.: C0-1608001/24

Page 3 of total 4 pages

**Measurement Results (Cont.):**

2. Calibration of pH Electrode (Serial No.: 3222623)

pH Standard Solution ( pH )	Measured Value		Uncertainty ( ± pH )
	( pH )	( mV )	
4.01	4.01	186.1	0.013
7.01	7.01	9.3	0.013
10.01	10.00	-164.5	0.013

Note : Adjust Curve to Buffer Solution pH (4,7,10)  
Temperature stability of micro bath : 25 ± 0.2°C

The above reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor  $k = 2.00$ , providing a level of confidence approximately 95%.

Calibrated by: Athipat  
REV.02 02/24/21

FE-169

Certificate No.: C0-1608001/24

Page 4 of total 4 pages

**Reference Method:**

- The calibration method used was CP-096 based on an in-house method.
- The temperature scale used was an ITS-90.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

**Reference Standard Instruments:**

Type	Serial No.	Cert. No.	Due Date	Traceability
Thermometer Readout	B7C853	10-0911001/23	Nov. 8, 2024	THC
Platinum Resistance Thermometer	4854	C0A30047	Oct. 22, 2025	FLUKE
Liquid Bath	XO111019	10-2405001/23	May 25, 2025	THC

**Remark:** This certificate is traceable to the International System of Unit (SI Unit) through:

- THC, Thai Heart Calibration Co., Ltd.
- FLUKE, Fluke Corporation, U.S.A.

**Measurement Results:**

( X ) Without Adjustment

Dimension of probe : Diameter 4 mm. Sensor Type : RTD (PT100)

Immersion Depth (mm.)	Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
120	22.00	22.2	-0.20	0.065
120	25.00	25.2	-0.20	0.065
120	28.00	28.2	-0.20	0.065

UUC : Unit Under Calibration

The above reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor  $k = 2.00$ , providing a level of confidence approximately 95%.

- End of Certificate -

Calibrated by: Pongsak  
REV.02 02/24/21



## CERTIFICATE OF CALIBRATION

Certificate No.: C0-1607004/24 Page 1 of total 2 pages

**Customer** WATER ANALYSIS CENTER CO., LTD.  
1/94 Moo 5, T.Kanham,  
A.U-thai, Ayutthaya 13210

**Equipment** Conductivity Meter  
**Manufacturer** EUTECH **Model** CON 2700  
**Serial No.** 2657889 **ID No.** WWL 0136  
**Description** -

**Environmental Conditions** Ambient Temperature: (20 ± 2) °C  
Relative Humidity: (50 ± 10) %  
Atmospheric Pressure: -

**Calibration Location** Jayhawks Laboratory (CL&GL)

**Received Date** 16 July 2024

**Calibration Date** 18 July 2024

**Date of Issue** 18 July 2024

**Condition of Artifacts** Used conditions but can be calibrated

Checked by: Approved by:   
Act as Technical Manager Representative of Managing Director  
( Dr. Ekachai Putitwong )

( ) ( Krisyosl K. ) ( ) ( Sakda Y. )  
( ) ( Patiphan K. ) (✓) ( Onnapa P. )  
( ) ( Pongsak H. ) ( ) ( Nitiphong K. )  
( ) ( Kanung C. ) ( ) ( Nonthachai K. )  
( ) ( Pramong P. ) ( ) ( Noppol P. )

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FE-169

REV.02 02/24/21

Certificate No.: C0-1607004/24

Page 2 of total 2 pages

Reference Method:

- The calibration method used was CP-177 based on an in-house method.  
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

Reference Standard :

Material	Batch Value	Lot Number	Due Date	Traceability
Conductivity Standard Solution	147.1 µS/cm	S230330005	Nov. 9, 2024	SCP Science
	1.423 mS/cm	S231129006	May 13, 2025	SCP Science

Remark: This certificate is traceable to the International System of Unit (SI Unit) through:  
- SCP Science.

Measurement Results: (Probe Serial No. : 93X219065)

Conductivity Standard Solution	Measured Value	Correction	Uncertainty ( ± )
147.1 µS/cm	149.0 µS/cm	-1.9 µS/cm	2.5 µS/cm
1.423 mS/cm	1.425 mS/cm	-0.002 mS/cm	0.0052 mS/cm

Note : Adjustment points: 147.1µS/cm 1.423mS/cm

The above reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor  $k = 2.00$ , providing a level of confidence approximately 95%.

- End of Certificate -

FE-169

Calibrated by: Athipat  
REV.02 02/24/21

## Certificate of Calibration

TEMPERATURE  
CONTROLLER ENCLOSURES



Certificate No.: MC 2407449

Page 1 of 3



**Customer** : Water Analysis Center Co., Ltd.  
1/94 Moo 5, T.Kanham, A.U-Thai, Ayutthaya 13210.

**Reference Job No.** : 24-1546 **Received Date** : 9 July 2024  
**Description** : Refrigerator **Resolution** : 0.1 °C  
**Manufacturer** : SANDEN INTERCOOL **Model** : SEC-1500SBD  
**Serial No.** : SEC1500201A-0708-00304 **ID No.** : WWL0038  
**Marking** : Additionally for the purpose of identification by this laboratory a label marked with this certificate number ( MC 2407449 ) has been attached to the case.  
**Method** : In-house calibration procedure MWI-T-033 this method Base on TLAS G-20-1/02-08 "Temperature Controlled Enclosures".  
**Location of Calibration** : Water Analysis Center Co., Ltd. ; Laboratory.  
**Environmental Conditions** : Ambient Temperature : ( 25.2 to 25.4 ) °C  
Relative Humidity : ( 62.1 to 63.3 ) %  
**Date of Calibration** : 9 July 2024 **Date of Issue** : 10 July 2024

Checked by: Approved by:   
Chalermkit Rakphada Aittipong Kanjanasit  
( Calibration Engineer ) ( Technical Manager )

The uncertainties are for a confidence probability of approximately 95%

This certificate is issued in accordance with the conditions of accreditation granted by the National Standardization Council of Thailand-Office of the National Standardization Council that has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of Master Calibration Co., Ltd.

Certificate No.: MC 2407449

Page 2 of 3

Reference Standard Instrument :

Description	Certificate No.	Serial No.	Due date	Traceable thru
Data Acquisition/Switch Unit	MC 2309074	MY44012056	7 Aug 2024	MCAL

With Thermocouple Type " T " ID. No.14/1 to 14/9

Traceability :

The measurement standard traceable to the international system of units (SI) through certificate as mentioned above

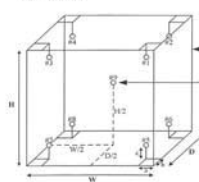
1. Calibration Procedure:

This Instrument was calibration according to TLAS G-20 by comparison with calibrated thermocouple type T under no load condition. The Thermocouples were placed on nine points and located one thermocouple in each of the eight corners of the chamber and was away from the each wall of 5 cm to 10 cm. And placed the ninth thermocouple within 2.5 cm of the geometric center of the chamber.

**Temperature Uniformity** - the maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady state conditions. The reference sensor should preferably be located at the geometric center of the chamber.

**Temperature Stability** - one-half of the greatest maximum difference of measured temperatures at any one sensor.

**Overall Variation** - The Difference of the maximum and minimum measured temperatures throughout observation.



Overall Ambient Temperature around the Chamber variation : 4.2 °C

Overall Line Voltage variation : 0.1 V

Chamber Size (W\*H\*D) : 171 cm x 157 cm x 60 cm

Figure 1 : Sensor Installation Location

Checked by:



Certificate No.: MC 2407449

Page 3 of 3

2. Result of calibration :

Temperature Measurement Accuracy Test

Indicating Temperature (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (±°C)
	#1	#2	#3	#4	#5	#6	#7	#8	Ref. #9	
3.0	4.2	4.0	4.0	4.0	4.0	3.7	3.8	3.5	3.5	1.0

Chamber Characterization Result

Desired Temperature (°C)	Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
4.0	3.0	3.0	0.8	0.9	2.1

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor  $k = 2.0$ , providing a level of confidence of approximately 95 %.

This certificate will certify of the calibrated equipment only.

End of Certificate

Checked by: Chalermkiri

[MCQ-F-077; Rev.6; Date : 22/04/2021]

SV 201005/2024

Cert. No. WAC-065  
Page 1 of 2

**CERTIFICATE OF CALIBRATION**

Instrument : DO Meter Machine : -  
Model : DO-31P Location : -  
Serial No. : 780065  
Manufacturer : TOA-DKK  
Measuring Range : 0.00 ~ 20.00 mg/l

Customer : Water Analysis Center Co.,Ltd.  
1/94 Moo.5 T.Kanham, A.U-Thai  
Ayutthaya 13210 Thailand

Date Of Received : 11 / 01 / 2024  
Date Of Calibration : 11 / 01 / 2024

Ambient Condition : Temperature 26 °C  
Humidity 58 % RH

Calibrated By : P. Yooyen  
(Ms. Phanee Yooyen)  
Technician

Approved By : N. Nipon Phungsomsak  
(Mr. Nipon Phungsomsak)  
Technical Manager

Date Of Issue : 15 / 01 / 2024

This Certificate may not be reproduced other than in full, except with the prior written approval of the head of the industrial instruments calibration center.

Automation Service Co.,Ltd. 929.929/1 Soi Pattanakarn30, Pattanakarn Rd., Suanluang, Suanluang, Bangkok 10250  
Tel. : 02-319-9994 ext. 721.725 | E-mail : iso@automation.co.th, service@automation.co.th | www.automation.co.th

Instrument : DO Meter  
Model : DO-31P  
Serial No. : 780065

Cert. No. WAC-065  
Page 2 of 2

Calibrate Procedure

- ☐ This instrument was calibrated by comparison with standard solution (PH/ORP)
- ☐ This instrument was calibrated by comparison with scattering plate value (Turbidity)
- ☐ This instrument was calibrated by comparison with conductivity (Conductivity)
- ☒ This instrument was calibrated by comparison with Sodium sulfite anhydrous (DO)

Condition of this result of calibration

1). Reference Standard Solution

Standard Lot No Batch Cert. No Due Date

Sodium Sulfite Power 408K1405 - - -

- 2). Traceability This certification is traceable to
- ☒ Kanto Chemical Co.,INC.
  - ☐ DKK Corporation

Result Of Calibration

Standard Solution (mg/l) at 25.7°C	Before Adjust		After Adjust	
	Indicator	Error	Indicator	Error
Zero	0.00	0.10	0.00	-
Span	8.02	6.45	8.02	-

DO Electrode No. OE270AA(5) S/N 111F0029

Calibrated By : P. Yooyen  
(Ms. Phanee Yooyen)  
Technician

**Certificate of Calibration**

Certificate No. : MT24-3208  
Page : 1 of 2

Customer : Water Analysis Center Co.,Ltd.  
Address : 1/94 M.5, Rojana Industrial Park, T.Kanham, A.U-Thai, Ayutthaya 13210

Description : Hot Air Oven Order No. : 1152/24  
Manufacturer : Memmert Received date : Mar 22, 2024  
Model : UF 260 Calibration date : Mar 22, 2024  
Serial No. : B620.0814 Environment Condition :  
Identification No. : WWL 0212 Temperature : (25±10) °C  
Calibration Place : Customer Laboratory Humidity : (50±30) %RH

Calibration Method : Calibration were conducted using In-house calibration procedure CP-MT-006 According to comparison with LXI Data Acquisition Switch Unit with sensor. The calibration methods based on Euramet Calibration Guide No.20 - guidelines on the Calibration of Temperature and/or Humidity Controlled Enclosures.

Reference Standard Instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
LXI Data Acquisition Switch Unit with Sensor	34972A	MY48020096	MT23-7163	Nov 30, 2024

The effect that the result relate only to the items calibrated. It was found accurate as shown on date and place of calibration only.

Traceability : This measurement are traceable to the International System of Unit (SI), through National Institute of Metrology Thailand ( NIMT )

The reported expanded uncertainty of measurement was based on standard uncertainty multiplied by coverage factor  $k = 2$ , providing a level of confidence of not less than 95%

Calibrated by : Mr.Yuttakorn Jamneansri

Approved by : Mr.Paruwat Phuklan  
Issue date : Apr 10, 2024

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Certificate No. : MT24-3208

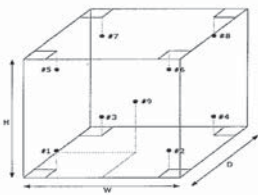
Page : 2 of 2

Function : Temperature measurement  
Calibration point : 104, 180 °C

Result : Without adjustment  
Resolution : 0.1 °C

Calibration point (°C)	Temperature of UUC* at each position (°C)									Uncertainty of measurement (+/- °C)
	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	Ch.8	Ch.9	
104	103.494	103.933	103.871	103.988	103.990	104.081	103.843	104.217	104.022	0.45
180	179.985	179.953	180.047	179.985	179.908	180.088	180.065	180.273	180.105	0.54

Setting temperature (°C)	Indicating Temperature (°C)	Measured stability (+/- °C)	Measured uniformity (°C)	Overall variation (°C)
104.0	104.0	0.34	0.66	1.3
180.0	180.0	0.41	0.86	1.2



- #1 Lower Left Front
- #2 Lower Right Front
- #3 Lower Left Rear
- #4 Lower Right Rear
- #5 Upper Left Front
- #6 Upper Right Front
- #7 Upper Left Rear
- #8 Upper Right Rear
- #9 Geometric Center

Front view

UUC\* = Unit under calibration

Uniformity = Maximum and Minimum difference of measured temperature at any probes and the measured temperature at the reference and same time.

Overall Variation = Difference of temperature value between the maximum and minimum any time.

Stability = One half of the maximum difference of measured temperatures at any one probe.

-0-0-

Rev.03 / Feb 2024

FM-MT-013



## Certificate of Calibration

Equipment: Balance  
Model: BL 210S  
Serial No. (or ID.): 15808131 (WWL 0022)  
Manufacturer: Sartorius  
Condition: In condition

Certificate No.: C01241754  
Issued Date: 05 June 2024  
Job No.: WO-00030302  
Page: 1 of 2

Customer: Water Analysis Center Co., Ltd.  
1/94 Moo 5, Rojana Industrial Park, Rojana Road,  
Tambol Kanham, Amphur U-Thai, Ayutthaya 13210 Thailand

Environment Condition: Temperature 26 °C ± 0.2 °C  
Humidity 50 %RH ± 2.6 %RH

Calibration Place: Water Analysis Center Co., Ltd. ( หอองค์อุ้งช้าง )  
1/94 Moo 5, Rojana Industrial Park, Rojana Road,  
Tambol Kanham, Amphur U-Thai, Ayutthaya 13210 Thailand

Calibration By: Mr. Polawad Ruamrurp  
Calibration Date: 05 June 2024  
The Method used: In-house method, CAL-WI-47, based on UKAS Lab 14  
Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Co., Ltd. Certificate No. C02240400

(Mr. Polawad Ruamrurp)

Person in charge

(Mr. Rungrod Jenkitrakulchai)

Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.  
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).  
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

บริษัท ดีเคเอส อีเซีย จำกัด  
DKSH Technology Limited  
2533 สุขุมวิท ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260  
2533 Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260  
Phone: +66 2629 7000 Email: info.calibration@dksh.com Website: www.dksh.com/certification-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C01-14: 12 Sep 2022



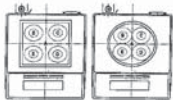
Certificate No.: C01241754

Page: 2 of 2

### Calibration Results:

#### Without Adjustment

Eccentric Error: Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.



Nominal Test Value 100 (g)				
Reference Points (g)				
A	B	C	D	E
-	0.0000	0.0001	0.0000	-0.0002

Repeatability: Determination of the standard deviation of weighing balance., Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
20	0.00004
200	0.00008

Error of indication from nominal or conventional mass value., Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
1	1.00001	1.0000	0.0000	0.00011	2.04
2	2.00002	2.0000	0.0000	0.00011	2.04
5	5.00002	5.0000	0.0000	0.00011	2.04
10	10.00001	10.0000	0.0000	0.00011	2.04
20	20.00001	20.0000	0.0000	0.00012	2.03
50	50.00003	50.0000	0.0000	0.00013	2.02
70	70.00004	70.0000	0.0000	0.00016	2.01
100	99.99996	100.0001	0.0001	0.00017	2.01
120	119.99997	120.0002	0.0002	0.00021	2.00
150	149.99999	150.0002	0.0002	0.00024	2.00
200	199.99996	200.0004	0.0004	0.00030	2.00

The End of Certificate

บริษัท ดีเคเอส อีเซีย จำกัด  
DKSH Technology Limited  
2533 สุขุมวิท ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260  
2533 Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260  
Phone: +66 2629 7000 Email: info.calibration@dksh.com Website: www.dksh.com/certification-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C01-14: 12 Sep 2022



บริษัท ไทยยูนิค จำกัด THAI UNIQUE CO., LTD.

80-82 ถนนประชาธิปไตย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200  
80-82 Prachathipat Rd., Bangkokunphrom, Pranakorn, Bangkok 10200  
Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail: thawat@thaiunique.com, Website: www.thaiunique.com

### PREVENTATIVE MAINTENANCE (PM) CHECK LIST

#### FOR ATOMIC ABSORPTION SPECTROMETER

Model & Serial Number: 240FS AA & M918250004

Customer: Water analysis center Co., Ltd.

Date: 25 Apr 2024

#### Safety

- ☒ Flame, Inspect/replace o-ring nebulizer, spray chamber and burner
- ☒ Flame, Clean nebulizer, spray chamber and burner
- ☒ Flame, Check liquid trap interlock, burner interlock, pressure relief bung interlock and shield interlock
- ☐ Furnace, Clean work head, electrode and shroud N/A
- ☐ Furnace, Clean PSD and PSD tray N/A
- ☐ Furnace, Check water pressure N/A
- ☒ Check drain tube
- ☒ Check exhaust system
- ☒ Check gas pressure sensor interlock
- ☒ Check and all gas hoses for SpectraAA
- ☒ Clean computer control

#### Optics

- ☒ Inspect/Replace that external optics surfaces
- ☒ Check Wavelength Accuracy the copper line at 323.0-326.0 nm = 324.7 nm
- ☒ Check that PMT % Gain the copper at 324.8 nm, 4 mA, 0.5 nm slit width, Gain = 2.9% (should be ≤ 64% or ≤ 380V)
- ☒ Flame, Check D2 lamp is work





บริษัท ไทยยูนิค จำกัด THAI UNIQUE CO., LTD.

80-82 ถนนประชาธิปไตย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200  
80-82 Prachathipatai Rd., Bangkokhuprom, Pranakorn, Bangkok 10200  
Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thawat@thaiunique.com, Website : www.thaiunique.com

Electronics

- ☒ Check power supply voltage
- ☒ Check cables and connectors
- ☒ Check/Clean all boards in the instrument
- ☐ Furnace, Check camera and align\*\* N/A

\*\*Option for Graphite Zeeman only

Mechanisms

- ☒ Flame, Check the burner adjuster
- ☐ Furnace, Check PSD accessories N/A

Analytical performance

- ☒ Clear the sample compartment
- ☒ Flame, Check uptake rate form 7.2-10.6 mL per minute = 8.5 mL/min
- ☒ Test Photometric noise, STDV = 0.0001 Abs (should be  $\leq 0.00050$  Abs)
- ☒ Flame, Test high solids nebulizer setting use
- Air/acet Cu 5 ppm = 0.79 Abs, and Precision
- (%RSD) = 0.4 % (should be  $> 0.55$  Abs and  $< 0.5\%$  RSD)
- or
- N20/Acet Cu 5 ppm = Abs, and Precision
- (%RSD) = % (should be  $> 0.3$  Abs and  $< 0.5\%$  RSD)
- ☐ Furnace, Characteristic mass and sensitivity Cu 25 ppb = Abs, and N/A
- Precision (%RSD) = % (should be  $\geq 0.15$  Abs and  $\leq 4.0\%$  RSD)

SIGN :

Engineer : Suriga Nacharoen

Customer : Water Analysis Center Co., Ltd.

2/2



บริษัท ไทยยูนิค จำกัด THAI UNIQUE CO., LTD.

80-82 ถนนประชาธิปไตย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200  
80-82 Prachathipatai Rd., Bangkokhuprom, Pranakorn, Bangkok 10200  
Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thawat@thaiunique.com, Website : www.thaiunique.com

PREVENTATIVE MAINTENANCE (PM) CHECK LIST

FOR ATOMIC ABSORPTION SPECTROMETER

Model & Serial Number: 2402 AA & M418230004

Customer : Water Analysis Center Co., Ltd.

Date: 26 Apr 2024

Safety

- ☐ Flame, Inspect/replace o-ring nebulizer, spray chamber and burner N/A
- ☐ Flame, Clean nebulizer, spray chamber and burner N/A
- ☐ Flame, Check liquid trap interlock, burner interlock, pressure relief bung N/A
- ☒ interlock and shield interlock
- ☒ Furnace, Clean work head, electrode and shroud
- ☒ Furnace, Clean PSD and PSD tray
- ☒ Furnace, Check water pressure
- ☒ Check drain tube
- ☒ Check exhaust system
- ☒ Check gas pressure sensor interlock
- ☒ Check and all gas hoses for SpectraAA
- ☒ Clean computer control

Optics

- ☒ Inspect/Replace that external optics surfaces
- ☒ Check Wavelength Accuracy the copper line at 323.0-326.0 nm = 324.7 nm
- ☒ Check that PMT % Gain the copper at 324.8 nm, 4 mA, 0.5 nm slit width, Gain = 50 % (should be  $\leq 64\%$  or  $\leq 380V$ )
- ☐ Flame, Check D2 lamp is work N/A

1/2



บริษัท ไทยยูนิค จำกัด THAI UNIQUE CO., LTD.

80-82 ถนนประชาธิปไตย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200  
80-82 Prachathipatai Rd., Bangkokhuprom, Pranakorn, Bangkok 10200  
Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thawat@thaiunique.com, Website : www.thaiunique.com

Electronics

- ☒ Check power supply voltage
- ☒ Check cables and connectors
- ☒ Check/Clean all boards in the instrument
- ☒ Furnace, Check camera and align\*\*

\*\*Option for Graphite Zeeman only

Mechanisms

- ☐ Flame, Check the burner adjuster N/A
- ☒ Furnace, Check PSD accessories

Analytical performance

- ☒ Clear the sample compartment
- ☐ Flame, Check uptake rate form 7.2-10.6 mL per minute = mL/min N/A
- ☒ Test Photometric noise, STDV = 0.0002 Abs (should be  $\leq 0.00050$  Abs)
- ☐ Flame, Test high solids nebulizer setting use N/A
- Air/acet Cu 5 ppm = Abs, and Precision
- (%RSD) = % (should be  $> 0.55$  Abs and  $< 0.5\%$  RSD)
- or
- N20/Acet Cu 5 ppm = Abs, and Precision
- (%RSD) = % (should be  $> 0.3$  Abs and  $< 0.5\%$  RSD)
- ☒ Furnace, Characteristic mass and sensitivity Cu 25 ppb = 0.16 Abs, and
- Precision (%RSD) = 3 % (should be  $\geq 0.15$  Abs and  $\leq 4.0\%$  RSD)

SIGN :

Engineer : Suriga Nacharoen

Customer : Water Analysis Center Co., Ltd.

2/2



บริษัท ไทยยูนิค จำกัด THAI UNIQUE CO., LTD.

80-82 ถนนประชาธิปไตย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200  
80-82 Prachathipatai Rd., Bangkokhuprom, Pranakorn, Bangkok 10200  
Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thawat@thaiunique.com, Website : www.thaiunique.com

PREVENTATIVE MAINTENANCE (PM) CHECK LIST

FOR ATOMIC ABSORPTION SPECTROMETER

Model & Serial Number: AA 240FS & AA09117073

Customer : Water Analysis Center Co., Ltd.

Date: 12 Feb 2024

Safety

- ☒ Flame, Inspect/replace o-ring nebulizer, spray chamber and burner
- ☒ Flame, Clean nebulizer, spray chamber and burner
- ☒ Flame, Check liquid trap interlock, burner interlock, pressure relief bung
- ☐ interlock and shield interlock
- ☐ Furnace, Clean work head, electrode and shroud N/A
- ☐ Furnace, Clean PSD and PSD tray N/A
- ☐ Furnace, Check water pressure N/A
- ☒ Check drain tube
- ☒ Check exhaust system
- ☒ Check gas pressure sensor interlock
- ☒ Check and all gas hoses for SpectraAA
- ☒ Clean computer control

Optics

- ☒ Inspect/Replace that external optics surfaces
- ☒ Check Wavelength Accuracy the copper line at 323.0-326.0 nm = 324.8 nm
- ☒ Check that PMT % Gain the copper at 324.8 nm, 4 mA, 0.5 nm slit width, Gain = 54 % (should be  $\leq 64\%$  or  $\leq 380V$ )
- ☒ Flame, Check D2 lamp is work

1/2

FR-SV-053 Rev. 01



# บริษัท ไทยยูนิค จำกัด THAI UNIQUE CO., LTD.

80-82 ถนนประชาธิปไตย แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200  
80-82 Prachathipatai Rd., Bangkhunphrom, Pranakorn, Bangkok 10200

Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail : thauwat@thaiunique.com, Website : www.thaiunique.com

## Electronics

- ☒ Check power supply voltage
- ☒ Check cables and connectors
- ☒ Check/Clean all boards in the instrument
- ☐ Furnace, Check camera and align\*\* N/A

\*\*Option for Graphite Zeeman only

## Mechanisms

- ☒ Flame, Check the burner adjuster
- ☐ Furnace, Check PSD accessories N/A

## Analytical performance

- ☒ Clear the sample compartment
- ☒ Flame, Check uptake rate form 7.2-10.6 mL per minute = 9.5 mL/min
- ☒ Test Photometric noise, STDV = 0.0002 Abs (should be  $\leq 0.00050$  Abs)
- ☒ Flame, Test high solids nebulizer setting use

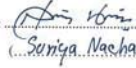
-Air/acet Cu 5 ppm = 0.78 Abs, and Precision  
(%RSD)= 0.3 % (should be  $> 0.55$  Abs and  $< 0.5\%$  RSD)

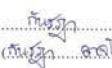
or

-N2O/Acet Cu 5 ppm = Abs, and Precision  
(%RSD)= % (should be  $> 0.3$  Abs and  $< 0.5\%$  RSD)

- ☐ Furnace, Characteristic mass and sensitivity Cu 25 ppb = Abs, and N/A  
Precision (%RSD)= % (should be  $\geq 0.15$  Abs and  $\leq 4.0\%$  RSD)

## SIGN :

Engineer :   
(Sunya Nacharoen)

Customer :   
(Customer Signature)

2/2

FR-SV-003 Rev. 05



## MEGAFIL CO., LTD.

99/183 Moo 3 Tambon Bang Rak Noi Amphur Muang Nonthaburi 11000  
Tel. 0-2528-6081-2 Fax. 0-2528-6083, 0-2525-7034  
www.megafil.co.th E-mail : megafil.group@gmail.com

## BSC Certification Test Report

Page 1 of 6

Certificate No. : M1439/24

Customer Name : LABORATORY WATER ANALYSIS CENTER COMPANY LIMITED

Customer Address : 1/94 Moo 5 Khan Ham Subdistrict,  
Uthai District, Phra Nakhon Si Ayutthaya 13210

Equipment : Biological Safety Cabinet Class II Type A2

Manufacturer : Microtech

Model : V6-T

Serial No. : 0972k097272

ID No. : WWL 0084

Were in accordance with ☒ EN 12469 ☐ NSF 49 ☐ Manufacturer's specification

Test Date : 15/10/2024

Due Date : 15/10/2025 or after HEPA filters are replaced or unit is moved

Test by : Mr. Pawut Wongnarakornkul

Approved by :

  
(Mr.Kridsada Thinhutaoei)  
Authorized Signatory

Issued Date : 16/10/2024

This calibration certificate documents the traceability to national standards, which realize the unit of measurement according to the International System of Units (SI).

This certificate may not be reproduced other than in full except with the prior written approval of the Megafil Company Limited.

Megafil Co.,Ltd.

MG-FM-7.8-001, R00 (01/07/19)



## MEGAFIL CO., LTD.

99/183 Moo 3 Tambon Bang Rak Noi Amphur Muang Nonthaburi 11000  
Tel. 0-2528-6081-2 Fax. 0-2528-6083, 0-2525-7034  
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Page 2 of 6

Certificate No. : M1439/24

Procedure Used : European Standard EN12469 : 2000 has the status of British Standard,  
Biotechnology Performance criteria for microbiological safety cabinets.  
NSF International Standard / American National Standard NSF / ANSI 49-2008  
Biosafety Cabinet : Design, Construction, Performance and Field Certification.  
Australian Standard : AS 1807.23-2000 Determination of intensity of radiation  
from germicidal ultraviolet lamps.  
Manufacturer's specification.

### 1. Downflow velocity test.

#### Measurement Information

No. of Rows	No. of Readings	Grid Spacing Front-Back	Grid Spacing Side-Side	Probe height Above sash
2	8	1/4,3/4	1/8,3/8	100mm

#### Measurement Data. (m/s.)

0.37	0.43	0.41	0.39
0.36	0.35	0.32	0.34

Average velocity 0.37 m/s ( 73 FPM.) Velocity range 0.25-0.50 m/s ( 49-98 FPM.)

Uniformity( EN: +/-20%avg.) 0.30-0.44 m/s ( 58-88 FPM.)

Supply filter dimension 24 x 72 (inch x inch) Supply filter area 10.69 SQ.FT

Downflow volume (Q) 780 CFM.

Result Summary ☒ Pass ☐ Fail

Equipment used : Thermo Anemometer Model 425 S/N : 02968605 Calibration date : 10/05/2024

Megafil Co.,Ltd.

MG-FM-7.8-001, R00 (01/07/19)



## MEGAFIL CO., LTD.

99/183 Moo 3 Tambon Bang Rak Noi Amphur Muang Nonthaburi 11000  
Tel. 0-2528-6081-2 Fax. 0-2528-6083, 0-2525-7034  
www.megafil.co.th E-mail : megafil.group@gmail.com

Page 3 of 6

Certificate No. : M1439/24

### 2. Inflow velocity test.

Select method. : ☐ DIM ☒ Exhaust velocity. ☐ MFG's Specifications

MFG's Specifications method

0.54	0.57	0.55	0.54	0.55
0.56	0.55	0.56	0.57	0.54
0.59	0.53	0.54	0.57	0.56
0.53	0.6	0.56	0.55	0.58
0.55	0.58	0.54	0.53	0.55

( m/s. )

Average Inflow velocity 0.47 m/s (93 FPM.) Velocity range  $\geq 0.40$  m/s (  $\geq 79$  FPM.)

Inflow dimension 8 x 72 (inch x inch) Inflow area 4.00 SQ.FT

Inflow volume(Q) 372 CFM

Result Summary ☒ Pass ☐ Fail

Adjustments Required ☐ Fan Speed ☐ Damper

Equipment used : Thermo Anemometer Model 425 S/N : 02968605 Calibration date : 10/05/2024

### 3. HEPA filter leak test.

#### Measurement Data

HEPA Filter	PAO Upstream Conc.(calculated)	Specification	Measured leak penetration
Supply HEPA Filter	18 $\mu$ g/L	<0.01%	<0.01%
Exhaust HEPA Filter	18 $\mu$ g/L	<0.01%	<0.01%

MG-FM-7.8-001, R00 (01/07/19)



Certificate No. : M1439/24

**Leak location**

Supply HEPA Filter

Back



Exhaust HEPA Filter

Back


**Result Summary**
☒ Pass

☐ Fail

Equipment used : Aerosol Photometer Model TDA-2H S/N : 20138 Calibration date : 08/05/2024

Equipment used : Smoke Generator Model TDA-6C S/N : 20192

**4. Airflow smoke patterns test**
**Measurement Information**

- Downflow Pattern test : Smoke shall be passed from one end of the cabinet to the other, along the centerline of the work surface, at a height of 4 inch (10 cm) above the top of the access opening
- View screen retention test : Smoke shall be passed from one end of the cabinet to the other, 1.0 in (2.5 cm) behind the view screen, at a height 6.0 inch (15 cm) above the top of the access opening.
- Work opening edge retention test : Smoke shall be passed along the entire perimeter of the work opening. Particular attention should be paid to corners and vertical edges.
- Sash/window seal test : Smoke shall be passed up the inside of the window 2 in (5 cm) from the sides and along the top of the work area.

Certificate No. : M1439/24

**Result Summary**

Downflow Pattern test	<input checked="" type="checkbox"/> Accept	<input type="checkbox"/> Non-Conforming
View screen retention test	<input checked="" type="checkbox"/> Accept	<input type="checkbox"/> Non-Conforming
Work opening edge retention test	<input checked="" type="checkbox"/> Accept	<input type="checkbox"/> Non-Conforming
Sash/window seal test	<input checked="" type="checkbox"/> Accept	<input type="checkbox"/> Non-Conforming

**5. Site installation**

Sash Alarm.	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> N/A
Interlock System.	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> N/A
Exhaust System Performance	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> N/A

**Remark / Recommendation**

ระบบ Site installation ไม่มีการตรวจสอบ เนื่องจากตู้ไม่มีฟังก์ชันนี้

**6. Illumination Test (Lighting) : Option**

Lighting should be adequate for safe working within the cabinet. Illumination measured at the work surface.

Lux

585	936	917	514
849	1400	1465	755

Equipment used : Digital Light Meter Model Easy View 31 S/N : 160404993 Calibration date : 08/05/2024

**Remark :**

Certificate No. : M1439/24

**7. Ultraviolet Lamp Test (UV) : Option**

Ultraviolet radiation where UV Lamp are fitted, the intensity of radiation at a wavelength of 254 nm.

 Shall be not less than 400 mW/m<sup>2</sup> when measures at work floor surface.

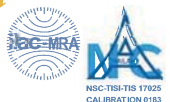
 mW/m<sup>2</sup>

630	1450	1480	690
380	920	930	390

Equipment used : UVC LIGHT METER Model UVC-254SD S/N : Q879819 Calibration date : 08/05/2024

**Remark :**

# Certificate of Calibration

**LIQUID BATH**


Certificate No.: MC 2314268

Page 1 of 3

 Customer : Water Analysis Center Co., Ltd.  
 1/94 Moo 5, T.Kantham, A.U-Thai, Ayutthaya 13210.

Reference Job No.	: 23-2833	Received Date	: 15 December 2023
Description	: Water Bath		
Manufacturer	: ESSTELL	Model	: EWB-122D
Serial No.	: 20180508122	ID. No.	: WWL 0214
Marking	: Additionally for the purpose of identification by this laboratory a label marked with this certificate number ( MC 2314268 ) has been attached to the case.		
Method	: In-House calibration procedure MWI-T-029 this method is reference to ASTM E715 "Liquid Bath".		
Location of Calibration	: Water Analysis Center Co., Ltd. ; Laboratory.		
Environmental Condition	: Ambient Temperature : ( 29.4 to 29.8 ) °C Relative Humidity : ( 49.0 to 52.0 ) %		
Date of Calibration	: 15 December 2023	Date of Issue	: 19 December 2023

 Checked by : Chalermkit  
 Chalermkit Rakphada  
 ( Calibration Engineer )

 Approved by : Aittipong  
 Aittipong Karjanasit  
 ( Technical Manager )

**The uncertainties are for a confidence probability of approximately 95%**

This certificate is issued in accordance with the conditions of accreditation granted by the National Standardization Council of Thailand-Office of the National Standardization Council that has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of Master Calibration Co.,Ltd.

Certificate No.: MC 2314268

Page 2 of 3

**Reference Standard Instrument :**

Description	Certificate No.	Serial No.	Due date	Traceable thru
Data Acquisition/Switch Unit	MC 2301270	MY44020009	9 Mar 2024	MCAL
With Thermocouple Type " T " ID. No.27/1 to 27/5				

**Traceability :**

The measurement standard traceable to the international system of units (SI) through certificate as mentioned above

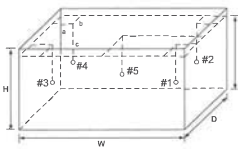
**1. Calibration Procedure:**

This Instrument was calibration according to ASTM E715 - 2007 by comparison with calibrated sensor under no load condition. The sensor were placed on five points and located one sensor in each of the eight corners of the chamber and was away from the each wall of 5 cm to 10 cm. And placed the five sensor within 2.5 cm of the geometric center of the chamber.

**Temperature Uniformity** - the maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady state conditions. The reference sensor should preferably be located at the geometric center of the chamber.

**Temperature Stability** - one-half of the greatest maximum difference of measured temperatures at any one sensor.

**Overall Variation** - The Difference of the maximum and minnum measured temperatures throughout observation.



- Overall Ambient Temperature around the Chamber variation : 1.3 °C
- Overall Line Voltage variation : 0.0 V
- Chamber Size (W\*H\*D) : 50 cm x 12 cm x 30 cm
- Water Level : 7 cm

Checked by : Chalermkit

[MCF-Q-077 ; Rev.6 ; Date : 22/04/2021]

Certificate No.: MC 2314268

Page 3 of 3

**2. Result of calibration :**

**Temperature Measurement Accuracy Test**

Indicating Temperature (°C)	Measured Temperature (°C) at Spread Locations					Uncertainty (±°C)
	#1	#2	#3	#4	Ref. #5	
45.0	44.5	44.4	44.5	44.5	44.6	0.45

**Chamber Characterization Result**

Desired Temperature (°C)	Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
44.5	45.0	45.0	0.62	0.88	1.5

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor  $k = 2.0$ , providing a level of confidence of approximately 95 %.

**This certificate will certify of the calibrated equipment only.**

**End of Certificate**

Checked by : Chalermkit

[MCF-Q-077 ; Rev.6 ; Date : 22/04/2021]

**Master Calibration Co.,Ltd.**

547 Soi Ratchadaniwat, Kwaeng Samsennok, Khet Huaykwang, Bangkok 10310  
Tel. : (02) 274 2978-9, (02) 2742987-8 Fax : (02) 274 2518, (02) 274 2989  
Website : www.mastercalibration.com E-mail : calibrate@mastercalibration.com

**Certificate of Calibration**

**TEMPERATURE  
CONTROLLER ENCLOSURES**



Certificate No.: MC 2314270

Page 1 of 3

Customer : Water Analysis Center Co., Ltd.  
1/94 Moo 5, T.Kantham, A.U-Thai, Ayutthaya 13210.

Reference Job No. : 23-2833 Received Date : 15 December 2023  
Description : Incubator  
Manufacturer : Memmert Model : IN260  
Serial No. : D619.0170 ID. No. : WWL 0192  
Marking : Additionally for the purpose of identification by this laboratory a label marked with this certificate number ( MC 2314270 ) has been attached to the case.  
Method : In-House calibration procedure MWI-T-033 this method is reference to TLAS G-20 "Temperature Controlled Enclosures".  
Location of Calibration : Water Analysis Center Co., Ltd. ; Laboratory.  
Environmental Conditions : Ambient Temperature : ( 25.2 to 25.6 ) °C  
Relative Humidity : ( 65.4 to 66.2 ) %  
Date of Calibration : 15 December 2023 Date of Issue : 19 December 2023

Checked by : Chalermkit  
Chalermkit Rakphada  
( Calibration Engineer )

Approved by : Aittipong  
Aittipong Kajanwasit  
( Technical Manager )

**The uncertainties are for a confidence probability of approximately 95%**

This certificate is issued in accordance with the conditions of accreditation granted by the National Standardization Council of Thailand-Office of the National Standardization Council that has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of Master Calibration Co.,Ltd.

[MCF-Q-077 ; Rev.6 ; Date : 22/04/2021]

Certificate No.: MC 2314270

Page 2 of 3

**Reference Standard Instrument :**

Description	Certificate No.	Serial No.	Due date	Traceable thru
Data Acquisition/Switch Unit	MC 2214032	MY41029992	26 Dec 2023	MCAL
With Thermocouple Type " T " ID. No.31/1 to 31/9				

**Traceability :**

The measurement standard traceable to the international system of units (SI) through certificate as mentioned above

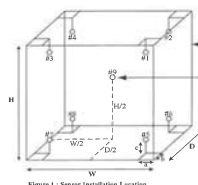
**1. Calibration Procedure:**

This Instrument was calibration according to TLAS G-20 by comparison with calibrated thermocouple type T under no load condition. The Thermocouples were placed on nine points and located one thermocouple in each of the eight corners of the chamber and was away from the each wall of 5 cm to 10 cm. And placed the ninth thermocouple within 2.5 cm of the geometric center of the chamber.

**Temperature Uniformity** - the maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady state conditions. The reference sensor should preferably be located at the geometric center of the chamber.

**Temperature Stability** - one-half of the greatest maximum difference of measured temperatures at any one sensor.

**Overall Variation** - The Difference of the maximum and minnum measured temperatures throughout observation.



- Overall Ambient Temperature around the Chamber variation : 0.4 °C
- Overall Line Voltage variation : 0.0 V
- Chamber Size (W\*H\*D) : 65 cm x 80 cm x 50 cm

Checked by : Chalermkit

[MCF-Q-077 ; Rev.6 ; Date : 22/04/2021]

Certificate No.: MC 2314270

Page 3 of 3

2. Result of calibration :

Temperature Measurement Accuracy Test

Indicating Temperature (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (±°C)
	#1	#2	#3	#4	#5	#6	#7	#8	Ref. #9	
35.0	35.2	35.2	35.2	35.2	35.1	35.1	35.0	35.1	35.1	0.44

Chamber Characterization Result

Desired Temperature (°C)	Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
35.0	35.0	35.0	0.13	0.21	0.4

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level of confidence of approximately 95 %.

This certificate will certify of the calibrated equipment only.

End of Certificate

Checked by : Chalermkit

[MCF-Q-077 ; Rev.6 ; Date : 22/04/2021]

Certificate No.: MC 2314269

Page 2 of 3

Reference Standard Instrument :

Description	Certificate No.	Serial No.	Due date	Traceable thru
Temperature Recorder RTD 100 Ohm	MC 2300163	M79252	9 Jan 2024	MCAL
Temperature Recorder RTD 100 Ohm	MC 2300164	5978194	9 Jan 2024	MCAL
Temperature Recorder RTD 100 Ohm	MC 2300165	M79251	9 Jan 2024	MCAL

Traceability :

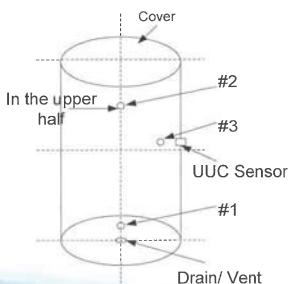
The measurement standard traceable to the international system of units (SI) through certificate as mentioned above

1. Calibration Procedure:

The equipment list above was calibrated an accuracy of temperature in a chamber of the sterilizer.

The calibration was performed by direct measurement of generated temperatures using the standard thermometer with three temperature sensors. The data was recorded in a period of fifteen minutes of the sterilizing status. The temperature scale used was based on ITS-90.

The calibration of sterilizer was carried out at the point indicated by following the In-house calibration method No. MWI-T-036 based on BS 2646 : 1993 : Part 5 in Tests for performance section.



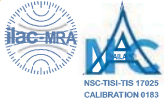
- Overall Line Voltage variation : 0.0 V

Checked by : Chalermkit

[MCF-Q-077 ; Rev.6 ; Date : 22/04/2021]

**Certificate of Calibration**

AUTOCLAVE



Certificate No.: MC 2314269

Page 1 of 3

Customer : Water Analysis Center Co., Ltd.  
1/94 Moo 5, T.Kantham, A.U-Thai, Ayutthaya 13210.

Reference Job No. : 23-2833 Received Date : 15 December 2023  
Description : Autoclave  
Manufacturer : TOMY Model : Autoclave ES-315  
Serial No. : 51135128 ID. No. : WWL 0083  
Marking : Additionally for the purpose of identification by this laboratory a label marked with this certificate number ( MC 2314269 ) has been attached to the case.  
Method : In-House calibration procedure MWI-T-036 this method is reference to based on BS 2646 : 1993 Part 5 "Autoclave".  
Location of Calibration : Water Analysis Center Co., Ltd. ; Laboratory.  
Environmental Condition : Ambient Temperature : ( 29.4 to 30.7 ) °C  
Relative Humidity : ( 50.0 to 52.0 ) %  
Date of Calibration : 15 December 2023 Date of Issue : 19 December 2023

Checked by : Chalermkit  
Chalermkit Rakphada  
( Calibration Engineer )

Approved by : Aittipong  
Aittipong Kanjanasit  
( Technical Manager )

The uncertainties are for a confidence probability of approximately 95%

This certificate is issued in accordance with the conditions of accreditation granted by the National Standardization Council of Thailand-Office of the National Standardization Council that has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of Master Calibration Co.,Ltd.

[MCF-Q-077 ; Rev.6 ; Date : 22/04/2021]

Certificate No.: MC 2314269

Page 3 of 3

2. Result of calibration :

Temperature Measurement Accuracy Test

Indicating Temperature (°C)	Measured Temperature (°C) at Spread Locations			Uncertainty (±°C)
	#1	#2	#3	
121	121.72	121.73	121.95	0.61

Characterization Result

Desired Temperature (°C)	Setting Temperature (°C)	Timer Setting ( min )	Indicating Temperature (°C)	Indicating Pressure ( kPa )	Measured Stability (±°C)	Measured Uniformity (°C)	Overall Variation (°C)
121	121	15.0	121	120	0.60	0.35	1.35

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level of confidence of approximately 95 %.

This certificate will certify of the calibrated equipment only.

End of Certificate

Checked by : Chalermkit

[MCF-Q-077 ; Rev.6 ; Date : 22/04/2021]

# เอกสารสอบเทียบเครื่องมือตรวจวัดปล่องเตาเผาขยะ



## CERTIFICATE OF CALIBRATION

Customer : Atom-Lab Environmental Company Limited  
Address : 54/110 Moo 4, Khlong Si, Khlongluang, Pathum Thani 12120  
Description of Equipment : Stainless Steel Nozzle  
Manufacturer : Apex Instrument  
Model Number : NS-SET  
Serial Number : -  
ID./Control No. : -  
Environment Conditions : Temperature (25 ± 2) °C  
Humidity (50 ± 15) % RH  
Cal. Date : 09/04/2024  
Issue Date : 09/04/2024

### Calibration Method or Calibration Procedure Used

US EPA Method (United State Environmental Protection Agency)

This certificate is traceable to national standard, which realize the units of measurement according to the International System of Units (SI).

### Result of Calibration

This certificate may not be reproduced other than in full except with prior Written approval of the Technical Manager, Envi Equipment Service Company Limited.

These reported uncertainties of measurement are expanded by a coverage factor of k=2, providing a 95% confidence level



Calibrated by : Mr. Sanya Sangnil

Approved by :

(Mr. Mana Fekhud)  
Technical Manger

## CALIBRATION RESULTS

### Sampling System Equipment Information

Nozzle Model : NS-SET  
Nozzle Number : -  
Nozzle Type : Stainless Steel

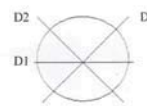
### Calibration Condition

Date : 09 April 2024  
Barometric Pressure : 758.99 mm Hg  
Calibration Device : Vernier, 0-150 mm  
Method Reference : US EPA Method

Nozzle ID	Nozzle Diameter				Different	(D1 + D2 + D3) / 3
	D1	D2	D3	ΔD	Davg	
Size	mm	mm	mm	mm	mm	mm
NS-4	3.18	3.08	3.08	0.000	3.080	
NS-6	4.76	4.62	4.62	0.000	4.620	
NS-8	6.35	6.39	6.39	0.000	6.390	
NS-10	7.94	7.88	7.88	0.000	7.880	
NS-12	9.52	9.52	9.52	0.000	9.520	
NS-14	11.11	10.87	10.87	0.000	10.870	
NS-16	12.70	12.68	12.68	0.000	12.680	

### Remark:

- D1, D2, D3 = There difference nozzle diameters, mm; diameter must be within 0.025 mm  
ΔD = Maximum difference between any two diameters, must be ≤ 0.100 mm  
Davg = (D1 + D2 + D3) / 3



Envi Equipment Service Co., Ltd.

Technician:

Nathan Johnson

Signature:

*Nathan Johnson*

Date:

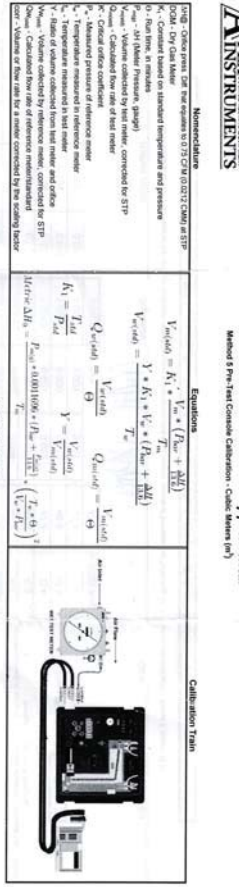
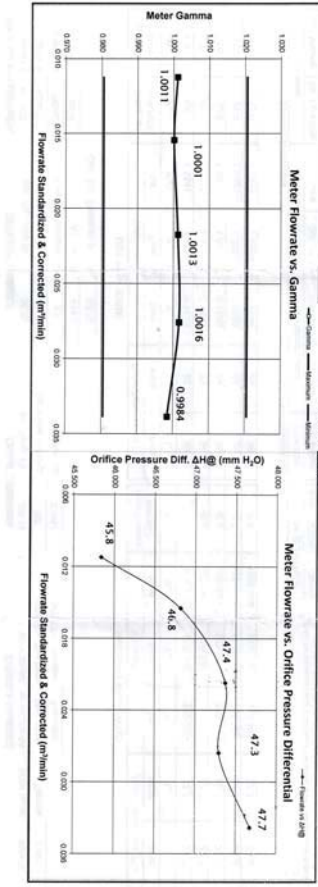
March 1, 2024

Apex Instruments - Address: 204 Technology Park Ln, Fuquay-Varina, NC 27506 USA | Tel: (919) 557-7200 Web: www.apexinst.com

Standardized Data				Calibration Results			
Run Time (minutes)	Flow Rate (m³/min)	Flow Rate (m³/min)	Flow Rate (m³/min)	Flow Rate (m³/min)	Flow Rate (m³/min)	Flow Rate (m³/min)	Flow Rate (m³/min)
5:00	120.0	1.1641	1.3219	0.0000	0.0000	0.0000	0.0000
6:00	80.0	1.3219	1.4671	0.0000	0.0000	0.0000	0.0000
7:10	50.0	1.4671	1.6421	0.0000	0.0000	0.0000	0.0000
10:00	25.0	1.6421	1.7979	0.0000	0.0000	0.0000	0.0000
15:00	13.0	1.7979	1.9638	0.0000	0.0000	0.0000	0.0000

Reference Equipment				Reference Equipment			
Model #	Serial #	Model #	Serial #	Model #	Serial #	Model #	Serial #
NS-SET	AS030117	NS-SET	AS030117	NS-SET	AS030117	NS-SET	AS030117
NS-SET	AS030117	NS-SET	AS030117	NS-SET	AS030117	NS-SET	AS030117

Reference Equipment				Reference Equipment			
Model #	Serial #	Model #	Serial #	Model #	Serial #	Model #	Serial #
NS-SET	AS030117	NS-SET	AS030117	NS-SET	AS030117	NS-SET	AS030117
NS-SET	AS030117	NS-SET	AS030117	NS-SET	AS030117	NS-SET	AS030117



## Temperature Display Calibration Data Sheet

**Meter Console Information**  
Model #: XC-572B-V  
Serial #: A2403117  
Units: Metric  
(English Units)

**Calibration Conditions**  
Pbar (mm. Hg): 30.50  
Humidity (%): 53  
Amb. Temp. (°F): 72.4

**Reference Device Information**  
TC Simulator Model: PIE 520-K  
Reference #: 105795  
Technician: SA

Temperature Sensors Calibration			
Reference Point	Ref. Thermometer Temperature	Thermocouple Display Temperature	Temperature Difference
#	°C	°C	°C
1	-18.0	-17.0	1.0
2	38.0	37.0	1.0
3	93.0	93.0	0.0
4	149.0	149.0	0.0
5	260.0	259.0	1.0
6	371.0	371.0	0.0
7	482.0	482.0	0.0
8	593.0	594.0	1.0
9	816.0	816.0	0.0
10	1038.0	1038.0	0.0
Maximum:			1.0
PASS			

NIST Reference Thermocouple ID: 210496952		
Ice Bath Temperature	Thermocouple Sensor Reading	Abs. Temperature Difference
°C	°C	°C
DGM Out	0.0	0.00%
Maximum:		0.00%
PASS		

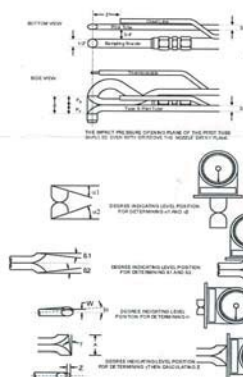
### Notes

- 1 For valid test results, the maximum difference between temperature readings should be  $\leq 1.0$  °C (EPA Method 5, Section 6.1.1.8)  
2 For valid test results, the maximum % difference between temperature readings should be less than 1.5% (EPA Method 2, Section 6.3)

Reviewed By: Nathan Johnson Date: March 1, 2024  
I certify that the above Thermocouple Display was calibrated in accordance with US EPA Methods, CFR 40 Part 60.

## Certificate of Calibration

S-Type Geometric Pitot Tube Calibration  
See the Code of Federal Regulations, Title 40, Part 60, Appendix A, Method 2, Item 4.



PITOT TUBE/PROBE #		A11516	
Parameter	Value	Allowable Range	Check
Assembly Level?	y	Yes, Y	PASS
Ports Damaged?	n	No, N	PASS
$\alpha 1$	1	$-10^\circ < \alpha 1 < +10^\circ$	PASS
$\alpha 2$	0	$-10^\circ < \alpha 2 < +10^\circ$	PASS
$\beta 1$	0	$-5^\circ < \beta 1 < +5^\circ$	PASS
$\beta 2$	0	$-5^\circ < \beta 2 < +5^\circ$	PASS
$\gamma$	1	N/A	-
$\theta$	1	N/A	-
Dt	0.375	.188" to .375"	PASS
A	0.942	$2.1D_t \leq A \leq 3D_t$	PASS
A/2Dt	1.256	$1.05 \leq P/D_t \leq 1.5$	PASS
Z = A tan $\gamma$	0.016	$Z \leq .125"$	PASS
W = A tan $\theta$	0.016	$W \leq .031"$	PASS

Certified by: KP Technician Signature: Calibration Date: 2/5/2024

I certify that pitot tube/probe number A11516 meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube certification factor of 0.84. See 40 CFR Pt. 60, App. A, EPA Method 2.

The factory, geometric calibration performed by Apex Instruments is valid until initial field use by the end user; this is under the assumption that the pitot tube is in the same physical condition as it was when calibrated. The end user may use the purchase date (or placed into service date) as a way to track initial and ensuing annual calibrations. A geometric calibration should be performed following each subsequent field use.

Purchase Date

Apex Instruments - Address: 204 Technology Park Ln., Fuquay-Varina, NC 27528 USA | Tel: (819) 557-7300 Web: www.apexinst.com

บริษัท แอส เอ็นจิเนียริ่ง จำกัด (มหาชน)  
CALL ME ENGINEER COMPANY LIMITED. (Head Office)  
89/553 หมู่ 5 ตำบลหนองปรือ อำเภอบางพลี 11140  
89/553 หมู่ 5 ตำบลหนองปรือ อำเภอบางพลี 11140  
โทรศัพท์: 02-55640245 (Fax ID.)  
0125564024574



## GASES AND FIRE DETECTION

### Contact Us

E-Mail: service@callmeeng.com Tel: +66(0)89 890 8246  
Web Site: www.callmeeng.com Line ID: @Callmeeng

## Certificate of Calibration



### CUSTOMER

Name: ATOM-LAB ENVIRONMENTAL CO., Ltd.  
Address: 54/110 Moo 4, T.Klong Si, A.Khlongluang  
Pathum Thani 12120  
Department/ Division/ Vessel: N/A

### UNIT UNDER CALIBRATION (UUC)

Cert. No. SE-CM24SER648

Description: Flue gas analyzer  
Manufacturers: Testo Model 327-1  
S/N: 01597787  
Measuring Range: O2: 0-21 %Vol, CO: 0-4000 PPM

Cal. Date: 23-Aug-24  
Cal. Due: 20-Aug-25  
Work Order No.: SE-CM24SER648  
Cal. Temp.: 25.0 ± 1°C  
Cal. Humidity: 55.0 ± 10 %RH

### Reference Standard

Description: TSG Standard Nitrogen + 99.99 %Vol  
DIN42 44747-109649-10  
Linde Mixture Gas in Nitrogen  
Component: CO = 100 PPM,  
O2 = 18.1 %

### Function Setup

Items: O2 CO  
Alarm:   
Unit: %Vol PPM

### Test Result

Visual Check	Criteria	Result	Operation Check	Criteria	Result
Structure	Proper	Good	Battery storage	Function	Pass
Indication, Symbol and letter	Proper	Good	Suction pump	Function	Pass
Gas sampling hose & probe	Proper	Good			

### Calibration Result

Parameter	Zero	Span	Response time, Sec.	Judgment	Note
O2 (%Vol)	Std.: 0.0 Acc.: 0.0 Before: 0.0 Cal.: 0.0 After: 0.0 Err.: 0.0	Std.: 18.1 Acc.: 18.1 Before: 18.1 Cal.: 18.1 After: 18.1 Err.: 0.0	≤30	Pass	Response time must be within 30 sec.
CO (PPM)	Std.: 0.0 Acc.: 0.0 Before: 0.0 Cal.: 0.0 After: 0.0 Err.: 0.0	Std.: 106.0 Acc.: 106.0 Before: 106.0 Cal.: 106.0 After: 106.0 Err.: 0.0	≤30	Pass	to reach to 90% of Std. concentration.

Std. = Standard, Read = Reading, Cal. = Calibrate, Acc. = Acceptance, Err. = Error, Sec. = Second

### Comment/ Suggestion:

This UUC has been tested and calibrated to meet the manufacturer's published specifications in accordance with our quality control system. The standards used for calibration are on record and traceable to the National Institute of Standard and Technology (NIST), and have accuracies equal to or greater than the UUC being tested. This result of calibration was found accurate as shown on date and place of calibration only.

Engineer Signatory	Approval Signatory	Company Stamp
Mr. Somrak Wongsriwong (Engineer Specialist) Date: 23-Aug-24	Mr. Weerayut Apiraman (Fire Division Chief) Date: 23-Aug-24	